

REMARKS

Applicants thank Examiner Maldonado and the Primary Examiner Fourson for the courtesy extended to Applicants' representatives of a telephonic interview on January 5, 2005. As agreed during the interview, Applicants provide the above amendments to further clarify the claimed invention. Support for the amendments can be found throughout the specification. Thus, no new matter is added. As discussed below, the claims pending in the application distinguish patentably over the cited art.

Allowed Claims

Applicants acknowledge with appreciation allowance of claims 10-13.

Rejections Under 35 U.S.C. 103(a)

The Office Action rejects claims 1, 6-9 and 20-25 as being obvious in view of the combined teachings of U.S. Patent No. 6,313,014 and U.S. Patent No. 6,506,662 of Ogura.

Claim 1, as amended, recites a method of processing a silicon substrate that includes evacuating a vacuum chamber in which the substrate is placed to a first pressure, and introducing a fluid other than molecular oxygen into the vacuum chamber as a background fluid.

Subsequently, ions are implanted into the substrate, *in the presence of the background fluid*, to form a buried oxide layer under a top silicon layer, wherein the fluid inhibits formations of threading dislocations in the top silicon layer for reducing a defect density of the processed substrate.

Sakaguchi fails to teach or suggest implanting ions in a substrate in the presence of a background fluid, introduced into a vacuum chamber in which the substrate is disposed in a previous step. Rather, Sakaguchi describes annealing a single-crystal silicon substrate by heat

treating a silicon substrate in a reducing atmosphere containing hydrogen, and in a separate step, forming an ion implantation layer in the substrate by oxygen implantation.

Further, Ogura fails to bridge the gap in the teachings of Sakaguchi to render the claimed invention obvious. In particular, Ogura describes a method of generating a silicon-on-insulator substrate by utilizing an apparatus that includes a plasma chamber in which plasma dissociation of selected gas molecules is utilized to generate ions, and further includes a *separate* reaction chamber in which a silicon substrate is exposed to ions, which were extracted from the plasma chamber and accelerated by acceleration electrodes.

Ogura does not teach introducing a fluid other than molecular oxygen into the reaction chamber *prior* to implanting ions in the silicon substrate. The passage at col. 8, line 50 to col. 9, line 2 of Ogura to which the Examiner refers simply states that the ion beam extracted from the plasma chamber may contain, in addition to oxygen ions, some hydrogen containing contaminant ions. Ogura explains that these contaminant ions can be purged from the substrate by a subsequent heat treatment. Such contaminant ions form part of the ion beam bombarding the substrate, and *not a background fluid* that is distinct from the ion beam. In addition, these contaminant ions are introduced into the reaction chamber at the same time as the oxygen ions, and not prior to implantation of the oxygen ions into the substrate.

Neither reference mentions or appreciates the problem solved by the present invention, namely the reduction of threading dislocations that occur as a result of ion implantation. Neither reference teaches or suggests Applicant's solution: utilizing a background gas while implanting ions into the substrate.

Hence, the combined teachings of Sakaguchi and Ogura fail to teach material features of claim 1. Accordingly, claim 1, and claims 6-9 that depend either directly or indirectly on claim 1, are patentable over Sakaguchi and Ogura.

The arguments presented above apply with equal force to establish that independent claims 20, 22, and 24, as amended, are also patentable over the combined teachings of Sakaguchi and Ogura. In particular, similar to amended claim 1, each of these amended claims recites implanting ions in the substrate, *subsequent* to introduction of a background fluid into a vacuum chamber in which the substrate is placed, and in the presence of the fluid.

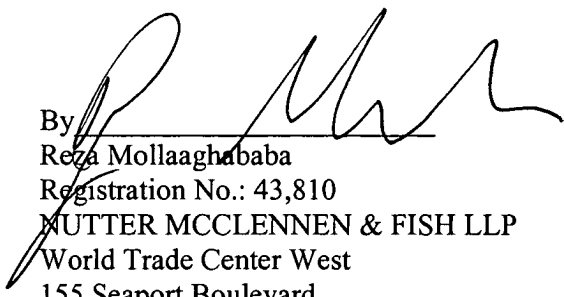
Hence, claims 20, 22, 24, and claims dependent thereon, namely, claims 21, 23, and 25, distinguish patentably over the combined teachings of Sakaguchi and Ogura.

CONCLUSION

In view of the above amendments and remarks, Applicants respectfully request reconsideration and allowance of the application. The Examiner is invited to call the undersigned at (617) 439-2514 if there are any remaining issues.

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Respectfully submitted,


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